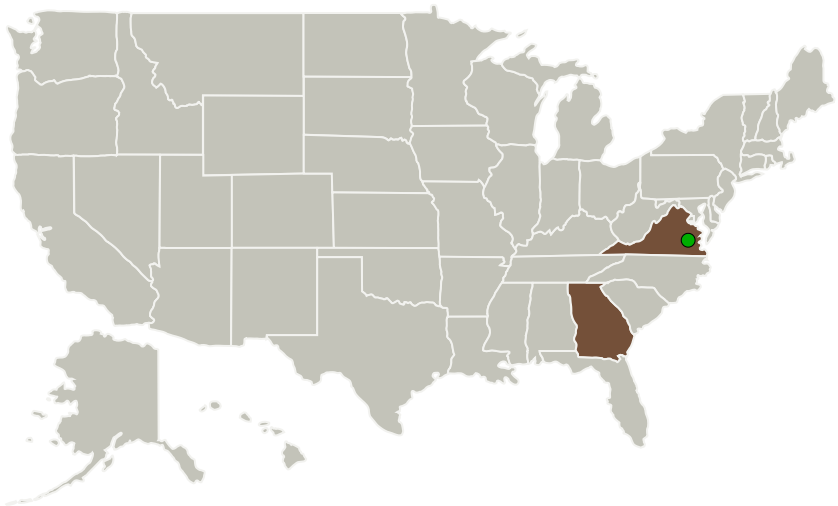
Innovative Tools for Structural Diagnostics of Rotorcraft Fatigue Critical Composite Parts, Phase I

Completed Technology Project (2011 - 2011)

Project Introduction

We propose the development of a validated analysis tool to characterize manufacturing defects and structural damage in composite parts. The objective of Phase I is to develop and verify a technology for accurate characterization of manufacturing defects and structural damage in fatigue-critical fiberglass/epoxy and carbon/epoxy composite structures based on three-dimensional micro-focus CT measurements. Key requirements for the diagnostic technology include: (a) ability to generate accurate subsurface geometry data for a composite structure with manufacturing defects (such as wrinkles and voids) and structural damage (matrix cracks and delaminations) based on the micro-focus CT measurements; and (b) automated ability to convert the geometry data into three-dimensional structural finite element models for assessment of the effects of defects and structural damage. Ability to measure the manufacturing defects and structural damage and understand their effects is a key to accurate assessment of part condition and condition based maintenance for composite fatigue-critical, flight-critical components and structure. Automated interpretation of nondestructive measurement of subsurface defects and structural damage is required for accurate structural diagnostics. Defect and damage measurement aided by rudimentary tools such as a ruler or a caliper could result in unacceptable measurement variation and affect the objectivity at making disposition decision of the affected part. Tools for rotorcraft diagnostics and condition based maintenance developed in the proposed effort will provide a mechanism to merge state-of-the-art in the nondestructive measurement and the durability and damage tolerance methods for composites and the implementation of the algorithms in commercial software.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Numerical Technology Company, LLC	Lead Organization	Industry	Roswell, Georgia
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Georgia	Virginia

Project Transitions

February 2011: Project Start

September 2011: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138658)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Numerical Technology Company, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

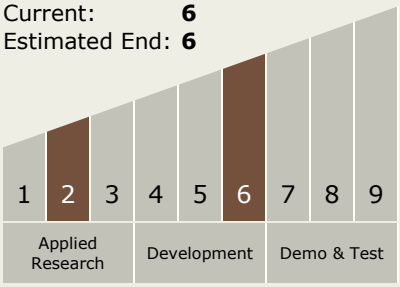
Carlos Torrez

Principal Investigator:

Yuriy Nikishkov

Technology Maturity (TRL)

Start: **2**
Current: **6**
Estimated End: **6**



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Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.1 Materials
    - TX12.1.2 Computational Materials

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System